

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- Claim 1 (Currently Cancelled).
- Claim 2 (Currently Cancelled).
- Claim 3 (Currently Cancelled).
- Claim 4 (Currently Cancelled).
- Claim 5 (Currently Cancelled).
- Claim 6 (Currently Cancelled).
- Claim 7 (Currently Cancelled).
- Claim 8 (Currently Cancelled).
- Claim 9 (Currently Cancelled).
- Claim 10 (Currently Cancelled).
- Claim 11 (Currently Cancelled).
- Claim 12 (Currently Cancelled).
- Claim 13 (Currently Cancelled).
- Claim 14 (Currently Cancelled).
- Claim 15 (Currently Cancelled).
- Claim 16 (Currently Cancelled).
- Claim 17 (Currently Cancelled).
- Claim 18 (Currently Cancelled).
- Claim 19 (Currently Cancelled).
- Claim 20 (Currently Cancelled).

Claim 21 (New Claim). A composition comprising:

a cerium doped lutetium yttrium orthosilicate mono crystal.

Claim 22 (New Claim). The composition of claim 21, wherein the crystal includes:

a monocrystalline structure of cerium doped lutetium yttrium orthosilicate,

$\text{Ce}_{2x}(\text{Lu}_{1-y}\text{Y}_y)_{2(1-x)}\text{SiO}_5$ where $x =$ approximately 0.00001 to approximately 0.05 and $y =$ approximately 0.0001 to approximately 0.9999.

Claim 23 (New Claim). The composition of claim 22 wherein x ranges from approximately 0.0001 to approximately 0.001 and y ranges from approximately 0.3 to approximately 0.8.

Claim 24 (New Claim). A method of making a crystal comprising the steps of:

- (a) mixing Lu_2O_3 , Y_2O_3 , SiO_3 , SiO_2 together to form a mixture;
- (b) heating the mixture;
- (c) interacting the heated mixture with an LSO seed crystal; and
- (d) growing an LYSO crystal from the interaction.

Claim 25 (New Claim). The method of claim 24 wherein Lu_2O_3 is substantially pure.

Claim 26 (New Claim). The method of claim 24 wherein Y_2O_3 is substantially pure.

Claim 27 (New Claim). The method of claim 24, wherein SiO_2 is substantially pure.

Claim 28 (New Claim). The method of claim 24, wherein the heating step includes:
heating the mixture to a molten state.

Claim 29 (New Claim). The method of claim 24, wherein the growing step includes:
separating and cooling the seed crystal.

Claim 30 (New Claim). A crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula $Lu_{(2-x-z)}Y_xCe_zSiO_5$, wherein $0.05 \leq x \leq 1.95$ and $0.001 \leq z \leq 0.02$.

Claim 31 (New Claim). The crystal scintillator of claim 30, wherein $0.2 \leq x \leq 1.8$.

Claim 32 (New Claim). The crystal scintillator of claim 31, wherein said scintillator has a luminescence wavelength of about 420 nm.

Claim 33 (New Claim). The crystal scintillator of claim 32, wherein said scintillator has a luminescence decay time of about 35-45 ns.

Claim 34 (New Claim). A scintillation detector, comprising:

(a) a crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$ wherein $0.05 \leq x \leq 1.95$ and $0.001 \leq z \leq 0.02$; and

(b) a photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.

Claim 35 (New Claim). The detector of claim 34, wherein said photodetector comprises a photomultiplier tube.

Claim 36 (New Claim). The detector of claim 34, wherein said photodetector comprises a charge-coupled device.

Claim 37 (New Claim). A scintillation detector, comprising:

(a) a crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$ wherein $0.2 \leq x \leq 1.8$ and $0.001 \leq z \leq 0.02$; and

(b) a photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.

Claim 38 (New Claim). The detector of claim 37, wherein said photodetector comprises a photomultiplier tube.

Claim 39 (New Claim). The detector of claim 37, wherein said photodetector comprises a charge-coupled device.